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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 09/559,903 | 04/26/2000 | Zhiping Yin | 303.925US1 | 1798 |

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| EXAMINER | |
|---|---|
| LANDAU, MATTHEW C | |
| ART UNIT | PAPER NUMBER |
| 2815 | |

DATE MAILED: 10/04/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 09/559,903 | YIN ET AL. | |
| | Examiner | Art Unit | |
| | Matthew Landau | 2815 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *16 June 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *27,33,36-38 and 44-52* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *27,33,36-38 and 44-52* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *6/16/06*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

## DETAILED ACTION

### *Allowable Subject Matter*

The indicated allowability of claims 27, 33, 36, 37, 38, and 44-52 is withdrawn in view of the newly discovered reference(s) to Kumar et al. and Chen et al.. Rejections based on the newly cited reference(s) follow.

### *Continued Examination Under 37 CFR 1.114*

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after allowance or after an Office action under *Ex Parte Quayle*, 25 USPQ 74, 453 O.G. 213 (Comm'r Pat. 1935). Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, prosecution in this application has been reopened pursuant to 37 CFR 1.114. Applicant's submission filed on June 16, 2006 has been entered.

### *Claim Rejections - 35 USC § 112*

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 27, 33, 36-38, and 44-49 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled

in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Regarding claims 27 and 44, the limitations "the annealed metal silicide layer being unoxidized" and "the metal silicide layer being essentially unoxidized" are not sufficiently supported by the originally filed application. The specification does not explicitly state that the metal silicide layer is unoxidized. The specification states that "Layer 50 thus provides the above-described function of oxide layer 22 (described with reference to Fig. 1-3) of protecting silicide layer 20 from exposure to gaseous oxygen during annealing of the silicide layer". However, this statement does not necessarily mean the silicide layer is unoxidized. Oxidization could occur at a different stage in the processing of the device. Furthermore, since layer 50 contains oxygen, it would seem that the silicide layer would become at least slightly oxidized when the silicide and overlying layer 50 are annealed. Therefore, the above limitations constitute new matter.

***Claim Objections***

Claim 27 is objected to because of the following informalities: the limitation "a silicon nitride layer on the layer comprising $Si_xN_yO_z$:H the polysilicon layer, the gate oxide layer, the metal silicide layer, the layer comprising $Si_xN_yO_z$:H, and the silicon nitride layer being patterned to form the gate stack" is objected to. It is suggested the limitation be changed to "a silicon nitride layer on the layer comprising $Si_xN_yO_z$:H, wherein the polysilicon layer, the gate oxide layer, the metal silicide layer, the layer comprising $Si_xN_yO_z$:H, and the silicon nitride layer ~~being~~ are patterned to form the gate stack" (or something similar).

Appropriate correction is required.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 27, 33, 36-38, and 44-52 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kumar et al. (US Pat. 6,541,164, hereinafter Kumar) in view of Applicant's admitted prior art (hereinafter APA), or in the alternative, as being unpatentable over Kumar in view of the APA and Chen et al. (US Pat. 4,905,073, hereinafter Chen).

Regarding claims 27 and 44, Figures 2, 11, 14, and 17 of Kumar disclose a gate stack, comprising: a gate oxide layer 14 over a semiconductor substrate 12; a polysilicon layer 16a on the gate oxide layer; a metal silicide layer 22 on the polysilicon layer; an antireflection layer 18 comprising $Si_xN_yO_z$:H (col. 9, lines 1-7) formed over and in physical contact with the metal silicide layer; and a silicon nitride layer 23 (col. 9, lines 35-37) on the layer comprising $Si_xN_y$-$O_z$:H, wherein the polysilicon layer, the gate oxide layer, the metal silicide layer, the layer comprising $Si_xN_yO_z$:H, and the silicon nitride layer are patterned to form the gate stack. Kumar does not disclose the specific claimed values for variable x, y, and z. Figure 3 of the instant application discloses an antireflective layer 26 made of $Si_xN_yO_z$:H, wherein x is from 0.39 to 0.65, y is from 0.02 to 0.56, and z is from 0.05 to 0.33 (see page 3, lines 13-15 of the instant specification). In view of such teaching, it would have been obvious to the ordinary artisan at

the time the invention was made to modify the invention of Kumar by using an antireflective layer having a composition that falls within the claimed ranges for the purpose of selecting known values that results in an effective antireflective layer. Furthermore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Kumar by using the claimed values, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). It is known that the composition of an antireflection layer affects the optical properties, therefore the claimed variables are result effective variables. The limitations "annealed metal silicide layer" and "the annealed metal silicide layer being the product of a process in which the metal silicide layer is subjected to an anneal treatment after the layer comprising $Si_xN_yO_z$:H is formed" are merely product-by-process limitations that do not structurally distinguish the claimed invention over the prior art. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process. *In re Thorpe*, 227 USPQ 964, 966. The burden is on Applicant to show that the process necessarily results in structurally different product from that disclosed in the prior art. Assuming, *arguendo*, that Applicant can prove that annealing a metal silicide layer inherently results in structurally different product, the claim would still be held obvious in view of Chen. Chen discloses annealing a metal silicide layer in a nitrogen atmosphere (col. 3, lines 49-51). In view of such teaching, it would have been obvious to the ordinary artisan at the time the invention was made to modify the invention of Kumar by annealing the metal silicide layer for the purpose of improving the resistivity (see col. 3, lines 49-

51 of Chen). Kumar does not disclose exposing the metal silicide layer to an oxidizing environment. After the above combination, which incorporates annealing the silicide layer in a nitrogen atmosphere, the silicide layer is still not exposed to an oxidizing environment. Therefore, it is inherent that the metal silicide layer is unoxidized. Further regarding claim 44, the limitation "means for protecting the metal silicide layer during an anneal" is merely a recitation of intended use that does not structurally distinguish the claimed invention over the prior art. The $Si_xN_yO_z$:H layer 18 of Kumar is capable of performing the recited function, therefore the limitation is met.

Regarding claims 33 and 47, Kumar discloses the layer 18 comprising $Si_xN_yO_z$:H has a thickness of 300 angstroms (col. 30, lines 58-61).

Regarding claims 36, 37, 45, and 51, Kumar does not disclose the specific claimed values for variable x, y, and z (specifically, x=0.5, y=0.37, and z=0.13). However, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Kumar by using the claimed values, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). It is known that the composition of an antireflection layer affects the optical properties, therefore the claimed variables are result effective variables.

Regarding claims 38 and 46, Kumar discloses the metal silicide is tungsten silicide (col. 8, lines 17 and 18). However, Chen discloses tungsten silicide and titanium silicide can be equivalently used for the same purpose. In view of such teaching, it would have been obvious to the ordinary artisan at the time the invention was made to modify the invention of Kumar by

using titanium silicide for the purpose of substituting an equivalent material that is known to be used for the same purpose (see MPEP 2144.06).

Regarding claim 48, the limitation "the means for protecting the metal silicide layer during is adapted to protect the metal silicide layer from gaseous oxygen during the anneal" is merely a recitation of intended use that does not structurally distinguish the claimed invention over the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. The $Si_xN_yO_z$:H layer 18 of Kumar is capable of performing the recited function, therefore the limitation is met.

Regarding claim 49, the limitation "the means for protecting the metal silicide layer during is adapted to alleviate stress exerted by the silicon nitride layer on layers underlying the layer comprising $Si_xN_yO_z$:H" is merely a recitation of intended use that does not structurally distinguish the claimed invention over the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. The $Si_xN_yO_z$:H layer 18 of Kumar is capable of performing the recited function, therefore the limitation is met.

Regarding claims 50, Figures 2, 11, 14, and 17 of Kumar disclose a gate stack, comprising: a gate oxide layer 14 over a semiconductor substrate 12; a polysilicon layer 16a on the gate oxide layer; a metal silicide layer 22 on the polysilicon layer; an antireflection layer 18 comprising $Si_xN_yO_z$:H (col. 9, lines 1-7) formed over and in physical contact with the metal silicide layer; and a silicon nitride layer 23 (col. 9, lines 35-37) on the layer comprising $Si_xN_yO_z$:H, wherein the polysilicon layer, the gate oxide layer, the metal silicide layer, the layer comprising $Si_xN_yO_z$:H, and the silicon nitride layer are patterned to form the gate stack. Kumar does not disclose the specific claimed values for variable x, y, and z. Figure 3 of the instant

application discloses an antireflective layer 26 made of $Si_xN_yO_z$:H, wherein x is from 0.39 to 0.65, y is from 0.02 to 0.56, and z is from 0.05 to 0.33 (see page 3, lines 13-15 of the instant specification). In view of such teaching, it would have been obvious to the ordinary artisan at the time the invention was made to modify the invention of Kumar by using an antireflective layer having a composition that falls within the claimed ranges for the purpose of selecting known values that results in an effective antireflective layer. Furthermore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Kumar by using the claimed values, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). It is known that the composition of an antireflection layer affects the optical properties, therefore the claimed variables are result effective variables. Kumar discloses the metal silicide is tungsten silicide (col. 8, lines 17 and 18). However, Chen discloses tungsten silicide and titanium silicide can be equivalently used for the same purpose. In view of such teaching, it would have been obvious to the ordinary artisan at the time the invention was made to modify the invention of Kumar by using titanium silicide for the purpose of substituting an equivalent material that is known to be used for the same purpose (see MPEP 2144.06). The limitation "annealed" is merely a product-by-process limitation that does not structurally distinguish the claimed invention over the prior art. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process. *In re Thorpe*, 227 USPQ 964, 966. The burden is on Applicant to show that the process necessarily results in structurally different product from that

disclosed in the prior art. Assuming, *arguendo*, that Applicant can prove that annealing a metal silicide layer inherently results in structurally different product, the claim would still be held obvious in view of Chen. Chen discloses annealing a metal silicide layer in a nitrogen atmosphere (col. 3, lines 49-51). In view of such teaching, it would have been obvious to the ordinary artisan at the time the invention was made to modify the invention of Kumar by annealing the metal silicide layer for the purpose of improving the resistivity (see col. 3, lines 49-51 of Chen). The limitation "for alleviating stress on underlying layers, canceling reflected radiation, and protecting the annealed, titanium silicide layer during an anneal from gaseous oxygen" is merely a recitation of intended use that does not structurally distinguish the claimed invention over the prior art. A recitation of the intended use of the claimed invention must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim.

Regarding claim 52, Kumar discloses the layer 18 comprising $Si_xN_yO_z$:H has a thickness of 300 angstroms (col. 30, lines 58-61).

***Response to Arguments***

Applicant's arguments with respect to the pending claims have been considered but are moot in view of the new ground(s) of rejection.

***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew C. Landau whose telephone number is (571) 272-1731.

The examiner can normally be reached from 8:30 AM - 5:30 PM. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kenneth Parker can be reached on (571) 272-2298. The fax phone numbers for the organization where this application or proceeding is assigned are (571) 273-8300 for regular communications and (571) 273-8300 for After Final communications.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should any questions arise regarding access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Matthew C. Landau

KENNETH PARKER
SUPERVISORY PATENT EXAMINER

September 28, 2006